

(PCT Article 36 and Rule 70)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/014495

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (Rule 12.3 and 23.1(b))
- ☐ publication of the international application (Rule 12.4)
- ☐ international preliminary examination (Rule 55.2 and/or 55.3)
2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-26 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- nos. _____ as originally filed/furnished
- nos.* _____ as amended (together with any statement) under Article 19
- nos.* 1-9 _____ received by this Authority on 18.04.2006 with telefax
- nos.* _____ received by this Authority on _____
- ☐ the drawings:
- sheets _____ as originally filed/furnished
- sheets* _____ received by this Authority on _____
- sheets* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages _____
- ☐ the claims, nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages _____
- ☐ the claims, nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement		
1. Statement			
Novelty (N)	Claims	<u>1-9</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-9</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-9</u>	YES
	Claims		NO
2. Citations and explanations (Rule 70.7)			
<p>This report makes reference to the following documents:</p> <p>D1: WO 02/096862 A (E. I. DU PONT DE NEMOURS AND COMPANY) 5 December 2002 (2002-12-05)</p> <p>D2: US 3 919 271 A (PARSHALL ET AL) 11 November 1975 (1975-11-11)</p> <p>D3: WILLIAM T. MILLER ET.AL: "SUBSTITUTION AND ADDITION REACTIONS OF THE FLUOROOLEFINS. IV. REACTIONS OF FLUORIDE ION WITH FLUOROOLEFINS" J. AM. CHEM. SOC, vol. 82, 1960, pages 3091-3099</p> <p>The present application relates to a method of hydrogenating nitrile functions contained in organic compounds on at least one heterogeneous catalyst, characterized in that hydrogenation is carried out in the presence of an ionic liquid, and in that the anion of the ionic liquid is selected from the group consisting of F⁻, Cl⁻, Br⁻, I⁻, acetate, trifluoroacetate, triflate, sulfate, hydrogen sulfate, methyl sulfate, ethyl sulfate, sulfite, hydrogen sulfite, AlCl₄⁻, Al₂Cl₇⁻, Al₃Cl₁₀⁻, AlBr₄⁻, nitrite, nitrate, CuCl₂⁻, phosphates, PO₃⁻, monohydrogen phosphate, dihydrogen phosphate, carbonate, hydrogen</p>			

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carbonate, sulfonate, tosylate and bis(trifluomethylsulfonyl)imide and the ionic liquid contains phosphonium ions and/or at least one five- or six-membered heterocycle that has at least one phosphorus or nitrogen atom and optionally a sulfur and/or oxygen atom.

D1 (see the passage cited in the ISR, in particular, example 3) is the closest prior art and discloses the heterogeneous hydrogenation of adipodinitrile to produce hexamethylenediamine on Raney nickel in the presence of tetraethylammonium fluoride hydrate (Fp. < 100°C) at a temperature of 75°C and 34 bar. Thus D1 differs from the subject matter of claim 1 in that the feature "ionic liquid contains phosphonium ions and/or at least one five- or six-membered heterocycle that contains at least one phosphorous or nitrogen atom and optionally a sulfur and/or oxygen atom" is not disclosed.

A technical problem is regarded as that of providing an additional method for hydrogenating nitrile functions contained in organic compounds.

The solution is described in the independent claims and relates to the particular cationic portion of the ionic liquid which contains phosphonium ions and/or at least one five- or six-membered heterocycle that has at least one phosphorous or nitrogen atom and optionally a sulfur and/or oxygen atom. This feature, in combination with the hydrogenation of nitrile functions contained in organic compounds, is not obvious to a person skilled in the art from the closest prior art in D1.